From:	BAYUK Dana
To:	"Pradeep Mugunthan"
Cc:	"Binglei Gong"; "Ben Hung"; Scott Coffey; DeMaria, Eva; "Matt Gamache (gamachem@cdmsmith.com)"; LARSEN Henning; "John Edwards"; "Jen Mott"; James Peale; "John Renda"; "Mike Murray"; Madi Novak; "Mike Riley"; "Miao Zhang"; "Lance Peterson (PetersonLE@cdmsmith.com)"; Sheldrake, Sean
Subject:	RE: Gasco: Call to Discuss Groundwater Modeling Figures
Date:	Tuesday, August 09, 2016 11:16:51 AM

Good morning Pradeep.

DEQ has reviewed the following items prepared by Anchor QEA, LLC (Anchor) for NW Natural:

- "Gasco Groundwater Modeling Workshop" presentation slides dated June 29, 2016 (6/29 slides); and
- Package of simulated equipotential contour maps and velocity vector figures provided by e-mail on July 20, 2016 (7/20 figures).

Anchor arranged the 6/29 workshop to present updates made to the groundwater model since the previous workshop on December 2, 2015 (12/2/15 workshop). The 6/29 workshop presented for the first time the results of calibrating the groundwater model based on DEQ and EPA comments provided during the 12/2/15 workshop and in subsequent correspondence exchanged following the workshop, including but not limited to DEQ's January 26 and May 27, 2016 e-mails.

In response to requests made during the 6/29 workshop, Anchor prepared the 7/20 figures which DEQ and EPA reviewed prior to a conference call with Anchor on August 2, 2016.

Based on our review of the 6/29 workshop presentation materials and the July 20th figures, DEQ:

- Acknowledges that modifications made to the groundwater model generally address DEQ's comments communicated to NW Natural during and subsequent to the 12/2/15 workshop; and
- Approves calibration with the following comments:
  - DEQ notes that the shoreline seepage boundary condition may limit the utility of future steady-state simulations and requests that the extent of this boundary condition be shown on figures in the future.
  - Simulated discharges from the LNG basin have increased from around 2 gpm to around 14 gpm, and DEQ requests that: 1) site data be used to confirm this value (e.g., compare to measured discharges from the LNG basin to the City POTW); and 2) this information be included in the model calibration portion of the modeling report.
  - DEQ requests that calibration documentation discuss how well the model matches head changes in the Deep Lower Alluvium WBZ in response to extraction wells operating in the upper and lower Alluvium WBZs.

In addition to providing our comments on model calibration, DEQ notes that during the 8/2 conference call we indicated that simulated piezometric heads shown on certain 7/20 figures are above ground surface at the LNG basin. Anchor agreed to further evaluate DEQ's observation and follow-up by e-mail. DEQ requests that NW Natural's evaluation be provided on or before Friday August 19th.

Furthermore, NW Natural conducted single-well pumping tests at selected monitoring wells to evaluate the horizontal hydraulic conductivity of the Fill WBZ in uplands portions of the Gasco and

Siltronic sites. The data was used to modify the hydraulic conductivity values in the groundwater model. During our review of the Single-Well Pumping Test Memorandum (see footnote), DEQ verbally requested a copy of the April 15, 2016 "C. Neville" e-mail cited in the document. According to the memo the e-mail supports NW Natural's use of the Cooper-Jacob method to interpret test data. DEQ requests a copy of the e-mail also be provided on or before Friday August 12th.

Based on the status of calibration, NW Natural will be moving forward with developing approaches for the vertical gradient and particle tracking analyses of the Deep Lower Alluvium WBZ, and the sensitivity analyses identified early in the model development process. As agreed during last Tuesday's (8/2) online meeting, a conference call will be arranged to discuss the scope and objectives of these modeling tasks before NW Natural proceeds with the work.

Pradeep, I'll check on the availability of the DEQ and EPA teams for a conference call in the next week or two to discuss these topics, and pass that information on to you. To avoid misunderstandings, DEQ's approval of NW Natural's evaluation of HC&C system transducer drift is also required before work on these tasks proceeds.

Feel free to contact me with questions regarding this e-mail and hope your day goes well.

Dana

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Footnote. Anchor QEA, LLC, 2016, "Single Well Pumping Test in Fill Water Bearing Zone Monitoring Wells at the NW Natural Gasco Site," June 13, a technical memorandum prepared for NW Natural.

From: BAYUK Dana
Sent: Thursday, August 04, 2016 4:20 PM
To: 'Jen Mott'; Sean Sheldrake; Eva DeMaria (DeMaria.Eva@epa.gov); Lance Peterson (PetersonLE@cdmsmith.com); Scott Coffey (coffeyse@cdmsmith.com); Matt Gamache (gamachem@cdmsmith.com); LARSEN Henning; Ben Hung; Pradeep Mugunthan; Mike Riley; John Renda; John Edwards; Binglei Gong; Miao Zhang
Subject: RE: Gasco: Call to Discuss Groundwater Modeling Figures

Good afternoon Pradeep.

This e-mail follows up on Tuesday's online meeting to discuss groundwater modeling figures and the gradient analysis. During the meeting I let you know I'd get back to you on the date for DEQ to provide comments on model calibration and the workshop, including the modeling figures provided on July 20th.

I wanted to let you know that we anticipate having our comments to you on Monday August 8th.

Thanks again for arranging the August 2nd meeting. Everyone here considered the discussions productive.

Hope your day goes well.

Dana

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-----Original Appointment-----
From: Jen Mott [mailto:jmott@anchorqea.com]
Sent: Monday, July 25, 2016 12:10 PM
To: Jen Mott; Sean Sheldrake; Eva DeMaria (DeMaria.Eva@epa.gov); BAYUK Dana; Lance Peterson (PetersonLE@cdmsmith.com); Scott Coffey (coffeyse@cdmsmith.com); Matt Gamache (gamachem@cdmsmith.com); LARSEN Henning; Ben Hung; Pradeep Mugunthan; Mike Riley; John Renda; John Edwards; Binglei Gong; Miao Zhang; Sean Sheldrake
Subject: Gasco: Call to Discuss Groundwater Modeling Figures
When: Tuesday, August 02, 2016 12:30 PM-2:00 PM (UTC-08:00) Pacific Time (US & Canada).
Where: Conference Call and Web Meeting

Dana, Sean, Eva, Lance, Scott, Matt, Henning, Ben, Pradeep, Mike, John R., John E., Binglei, Miao –

A call has been scheduled to discuss the groundwater modeling figures provided to DEQ on July 20 and the gradient analysis approach.

Meeting information

Topic: Gasco: Call to Discuss Groundwater Modeling Figures
Date: Tuesday, August 2, 2016
Time: 12:30 pm, Pacific Daylight Time (San Francisco, GMT-07:00)
Meeting Number: 801 837 155
Meeting Password: (This meeting does not require a password.)

To start or join the online meeting

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Pradeep is the host for this meeting. Ben is the alternate host.